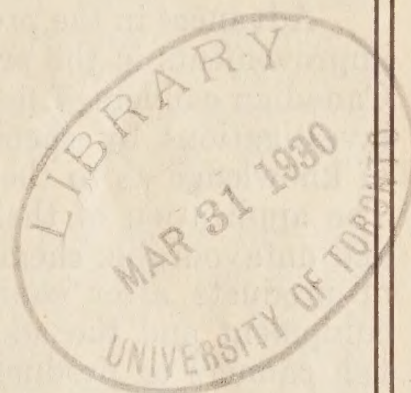


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# FISH CANNING IN CANADA

## A Non-Technical Outline of Methods Followed in Canning Fish and Shellfish

ISSUED BY THE FISHERIES BRANCH  
DEPARTMENT OF MARINE AND FISHERIES  
OTTAWA



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## Canned Fishery Products of Canada

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**P**RODUCTION of canned fish and canned shell-fish has become one of the most important divisions of the Canadian fishing industry, and in this bulletin brief descriptions are given of the canning methods followed. In Canada these canned foods are put up under conditions which give every reasonable guarantee of their quality. Their production is subject to the provisions of the Meat and Canned Foods Act, and they are so rich in nutritive value that they are among the best articles of diet obtainable anywhere. From the standpoint of national business, moreover, the production of canned salmon, canned lobsters and other canned fish and shellfish is of first rate importance for it adds many millions of dollars every year to the value of the Dominion's fisheries output.

Advances in the processing of canned goods have been among the outstanding improvements in the preparation of foodstuffs in the past couple of decades, and Canadian canners of fish and shellfish have fully kept pace with progress. Special investigations by chemists and bacteriologists have greatly enlarged the sum of knowledge as to the methods best to be followed in producing canned foods. The application of their discoveries in the prevention of bacterial development and unfavourable chemical reactions, and in the prevention of the discolouration of products after canning, together with the invention of improved canning equipment and the adoption of high standards of sanitation, have enabled the fish canners to produce goods of finest quality. A natural result of this condition has been the increasing use of Canadian canned fish products, and further increase is certain with the widening realization that canned fish and canned shellfish are not only rich in food value but contain exceptionally high percentages of vitamins and iodine which are effective safeguards of health.

### CANNED SALMON

Salmon canning, first among Canadian fish canning enterprises in point of size and value of the annual production, is confined almost entirely to British Columbia where in 1928, for example, the pack was over two million cases—forty-eight pounds of salmon to a case—and had a marketed value of nearly \$13,800,000. A few hundred cases of Atlantic salmon are canned in Nova Scotia and Quebec. It is salmon canning in British Columbia that is described in this bulletin but salmon canning processes elsewhere are the same in principle.

When salmon are brought to a cannery in the fishing boat or the carrying scow they are placed in bins which are kept clean by frequent use of streams of water. As canning begins the fish from a bin are fed to a machine known as the "Iron Chink" which owes its name to the fact that it does the work which in other days was ordinarily done by a number of Chinese workers. The "Iron Chink" grips each fish, adjusting itself automatically to the varying sizes, cuts off head and tail and all six fins, splits the body and ejects the viscera—and does all these operations at the rate of sixty fish a minute. The body of the fish drops from the machine to a belt conveyer, while the waste is carried off by another conveyer, sometimes to be used in the manufacture of fish oil and meal.

As the salmon bodies are borne along the conveyer they are washed by continuous streams of clear cold water and are inspected by workers known as

"washers"; if, by chance, any of the fish have not been thoroughly cleaned by the running streams of water they are lifted from the conveyer by the "washers" who clean them by hand. At a certain point on the conveyer, in most plants, the fish reach an elevating device which forces them up through a gang of revolving knives which cut them into pieces of suitable size for the cans. Where brine salting methods are followed, the fish fall from the "gang knives" into a brine tank, and this is the plan which usually prevails in canneries where cans are filled by hand. Where cans are filled automatically by machinery—the method of operation now in use in most plants—the fish, on dropping from the "gang knives," fall into a bin which inclines toward the filling section. At this point a stream of cans rolls continuously down a runway and as the streams of fish and cans converge the filling machine packs the cans and a uniform quantity of salt is added by the salting device. In some plants the "gang knives" are not used but the filling machine both cuts and packs the fish. The rate at which cans are filled by the machine ranges from about sixty to eighty cans a minute, although in some canneries the machine operates at considerably higher speed.

From the filling section the cans are carried along by the conveyer to pass before expert examiners who remove any which have been improperly packed. An automatic device weighs each can as it comes along, ejecting at one side of the conveyer any can which is under weight, and the necessary additional quantity of fish is packed in on top. From the examiners the cans move along the conveyer to the clinching machine which feeds a steady stream of covers and clamps them loosely on the cans.

In some canneries the cans next pass into a steam box where the heat, penetrating the can, causes expansion of the water content of the fish so that on cooling there will be a vacuum. In other plants the steam box has now been replaced by "vacuum closing machines" which admit the cans through airports to chambers from which most of the air has been pumped, and there the covers are fastened down tightly. Where the steam box method is used the box encloses a perforated steam pipe, and several other steam pipes, and the cans are carried in endless procession by mechanical conveyers, being kept for from five to fifteen minutes at a temperature of about 212° Fahrenheit. The vacuum or partial vacuum produced by either of these methods keeps the ends of the cans collapsed, reduces the strain on the sealed cans in the subsequent cooking processes, and checks the growth of micro-organisms. Either of the outlined methods of producing the requisite vacuum is satisfactory, but the vacuum machines take up much less space than the steam boxes, and they are regarded by many canners as having other advantages as well.

After the covers have been sealed tightly on the cans, either in the course of "vacuum closing machine" operations or by means of a closing machine where the steam box method of creating a vacuum is used, the cans are placed on large iron trays which are then stacked one above the other on low trucks or cars. Several of these laden trucks, carrying in all a great number of cans, are pushed along a narrow track into a big iron retort or oven, the door of the oven is closely fastened, and steam is turned on within until a temperature of 240° Fahrenheit is reached. The cans are kept in this temperature for from eighty to one hundred minutes so that the contents are thoroughly cooked and destruction of all bacteria which might otherwise affect the product is ensured. Then the oven is opened, the cans are taken out, washed, and allowed to cool and dry. In nearly all British Columbia plants the cans are also lacquered. Labelling is done by special labelling machines and the cans are then placed in the shipping cases for transportation to market. Each case contains either forty-eight one pound cans or ninety-six half pound cans; but in the official statistical records showing the pack, the production is always expressed in terms of the forty-eight pound case.

## LOBSTER CANNING

Canada's catch of lobsters, which are taken in Atlantic coast waters only, is now from thirty to thirty-three million pounds a year and the greater part of it is marketed in the canned form. In recent years the production of canned lobsters in the four Atlantic coast provinces—Nova Scotia, New Brunswick, Prince Edward Island, and Quebec—has averaged about 118,000 cases yearly, the case in this reckoning containing forty-eight cans with a total weight in lobster meat of thirty-six pounds. The value of the pack of canned lobsters varies, of course, from year to year with the fluctuation of prices, but in 1928 the marketed value of the Dominion's canned lobster production was \$2,883,922.

Canning is carried on in many lobster factories, but the process employed is the same in principle in them all. Since rapidity of operation is essential to the production of a first class lobster pack, canning begins as soon as possible after the lobsters have been brought to the cannery from the traps in which they were caught by the fishermen. First they are boiled in large vats containing clean salt water or salted fresh water. The boiling is from eight to fifteen minutes according to the size of the lobsters; about 200 pounds of lobsters are boiled at a time. This preliminary boiling is for the purpose of loosening the meat from the shell so that it can be easily removed.

After this boiling the lobsters are placed on large tables known as "coolers" for draining and cooling, and then the claws, arms and tails are broken from the bodies. The claws are split by a small cleaver, and the meat is "shaken" from the claws, "pulled" from the tails with a fork and "picked" from the arms with a small knife. The meat is then thoroughly washed in cool running water, particular attention being paid to the removal of all blood and that part of the gut in the tail. The meat is next packed carefully into parchment lined cans of the particular size used—several sizes are used by the trade. A small quantity of weak pickle is put in each can to prevent the meat drying out in the subsequent cooking. The tails are placed around the inside of the cans at the bottom, arm meat in the centre, and claws on top to make an attractive and uniform pack. Each can is weighed so that it may be certain to contain the required legal quantity of meat. The cans are next taken to the "sealer" where the covers are rolled on and thus hermetically sealed.

In some canneries the cooking is done in steam retorts, in others the cans are boiled in water. When the hot water method is used there may be one continuous cooking period of from two to two and a half hours or two shorter periods, which give the cans an opportunity to cool after the first period. The practice of "venting" the cans is now not common but it was generally followed until a few years ago. One shorter cooking period is employed when retorts are used as higher temperature and pressure can be obtained; this period is usually about forty or forty-five minutes, according to the size of cans being processed.

After removal from the retort or cooking vat, as the case may be, the cans are cooled and dried; then they are tested for defectives and are polished to remove the discoloration which steam or boiling water usually produces on the tin. If labelling is required it is then done and the cans are packed in wooden cases, containing 12, 24, 36 or 48 cans for shipment to the domestic market or abroad. The cases are usually wire-strapped to prevent damage in transit.

An interesting development of comparatively recent years in the lobster canning industry has been the use of glass containers, instead of cans, in some instances. In certain markets glass containers are preferred but, of course, their use adds to the cost of the product. The process of packing in glass does not differ in essentials from that followed when cans are used.

## THE SARDINE INDUSTRY

Canadian sardines are the young of the herring, and the sardine canning industry in the Dominion is confined to the Bay of Fundy and Passamaquoddy bay districts in New Brunswick. Vast quantities of sardines are landed in these areas every year, and it is here that the largest sardine canning plant in the British Empire is operated. In 1928, the total production of Canadian canned sardines was 257,881 cases—100 cans weighing a total of twenty-five pounds to the case in most instances—with a marketed value of nearly \$1,033,000.

Each cannery has its own fleet of carrying boats, "buyers," as they are called by the fishermen. The captain of each boat arranges with the weir owner for the purchase of his supply of sardines while the fish are yet alive and swimming in the weir. At low tide the weir is seined, the fish are dipped out into the weir-man's small boats, and as fast as one of the boats is loaded it is hauled alongside the "buyer" and discharged; in some instances in the Grand Manan area, the fish are dipped direct from the weir to the "buyer." The hold of the carrying boat in which the sardines are put is watertight and kept scrupulously clean. With every tub of sardines that is dumped in, a bucket or more of salt is also thrown into the hold, and by the time the entire load has been taken on board the sardines are practically afloat in brine. As the fish are brined as soon as they are taken from the water there is no chance of deterioration setting in before the curing process is begun. It is necessary that the fish remain in this strong pickle for at least three hours, and, should the carrying boat reach the cannery before the fish have been in brine for that length of time, unloading does not begin until the three hours have expired.

At the cannery wharf the fish are hoisted out in tubs which hold about three-quarters of a barrel each. At the outer end of the wharf is a heavy stage about twelve or fourteen feet high, with covered roof and walls, and on its top is an electric hoister, which is operated by one man. As the tubs of fish are hoisted from the boat they are dumped into a bin on the stage floor, which is connected with an inclined chute running to the washing shed on the lower floor of the cannery. The bin is constantly flushed with sea water from a hose. As both the bin and the chute are watertight and there is quite a drop from the floor of the landing platform to the lower end of the chute, the fish literally go swimming along from the landing stage above to the washing tank below. The conveyer does not run directly to the top of the washing tank, but, rather, runs parallel with it, about three feet above, and a subsidiary chute runs to the tank. In this chute is an iron screen bottom, and through it the fish scales, which have been washed off, drop to another sluiceway which conveys them to a separate tank. They are sold to pearl essence factories at an average price of about five cents per pound.

A steady stream of sea water is pumped into the tank and the fish are constantly stirred and thoroughly washed. From the tank, the fish are carried to the floor above by means of a conveyer containing a continuous set of buckets, about three inches high and fourteen inches wide. As the conveyer reaches its apex, the fish are automatically emptied into a hopper beneath, which is just above the flaking machine, to which the fish are carried by means of a second conveyer. The flaking machine is a metal drum, which rotates on an axle and contains a continuous series of buckets about three inches wide and five inches deep. The fish are dumped from the hopper-carrier into these buckets, and as the drum turns over the fish fall to the "flake" under it, one bucket at a time and each bucket containing just enough fish to make a tier across the flake. One revolution of the drum spreads the fish over the whole length of the flake, which has been automatically travelling under it at uniform speed. Just before

the flake comes under the machine to receive the fish hot water for cleansing purposes streams down on it from a scouring device. The flakes themselves are made entirely of iron, each twenty-two inches wide and three feet long. A solid iron frame-work, a little more than one inch wide, goes all the way around both sides and ends of the flake, and the inner portion is made of stout wire woven together, about one-quarter inch in diameter.

The flakes are carried to the flaking machine on an automatic conveyer. One man constantly feeds them to the conveyer and another is constantly taking the filled plates and placing them in the "racks," which are simply upright frameworks about seven feet high with angle irons fastened about three inches apart from the top to the bottom of the inner walls. Each rack holds about twenty-five flakes and as fast as the flakes of fish come from the flaker they are placed on these angle irons. As fast as a rack is filled, it is wheeled into the steam cooker, or steam box as it is commonly called, which is simply a compartment built in the cannery with iron walls and ceiling and a cement floor, with drainage pipe to carry off escaping moisture. The capacity of a large cooker of this kind is about eighteen racks, which is equivalent to about two hogsheads or ten barrels of fish. The fish are cooked by the direct application of steam from two rows of perforated steam pipes in the cooker. From eleven to fifteen minutes are required for cooking, the length of time varying according to the size of the fish.

From the cooker the racks, which are equipped with rollers, are wheeled to the dryer so that all moisture may be dried from the fish before it is packed in the can. The dryer is a very large compartment which holds about one hundred racks, and heat from a large steam coil is driven in by a rapidly rotating fan. The average time required for drying is approximately one hour, but a great deal depends on the moisture of the atmosphere when the fish are being processed.

From the dryer the racks are wheeled directly to the packing room, which has two rows of tables through its entire length. Each table is seven feet long and three feet wide. All the packing is done by women and two of them work at each table. An automatic conveyer runs between the two rows of tables and flakes of fish are fed into it by a man operator. Each packer removes a flake of fish as required and sets it on a table, and, by an ingenious contrivance in this conveyer, as fast as a flake is taken off another moves ahead and takes its place, so that the conveyer is continually filled. As soon as all the fish have been taken off by a packer, she puts the empty flake on the reverse side of the conveyer and it is carried to the other end of the packing room, where it is again placed in a rack and wheeled back to the flaking shed. Underneath the packing tables there is a small conveyer which carries away waste fish to the fish meal plant in another part of the cannery.

Above the packing tables is an endless belt which carries the cans from the can-making machine and drops them into a large bin which extends for the entire length of the packing room. Standing at the side of the table, the packer takes a flake of fish off the conveyer, reaches into the bin and takes out each can that she packs and puts the empty flake back on the conveyer again without moving from her position. The packing involves the snipping off of the heads and tails of the fish with a pair of sharp scissors, which is done with remarkable dexterity and accuracy. The fish are cut just the right length for the can and are packed in it carefully and neatly. As each can is filled, it is placed in a tray on a table, each tray holding twenty-five cans in a single tier. When full the trays are collected and placed on four-wheel trucks and conveyed to the automatic oil-filling machine. At this machine, the tray of cans is placed in the contrivance, a lever is pulled, and from twenty-five openings a regulated quantity of oil—just enough to fill each can brimful—drops down. From the oil-filling machine, the trays are loaded on trucks and wheeled to the automatic sealing or

closing machines. These heavy powerful devices roll the cover on the can with absolute tightness, the cover first being fitted with a rubber gasket, which goes inside the roll. Each closing machine turns out about thirty-four cans a minute.

From the closing machines the cans drop onto a conveyer, which carries them to retorts for sterilization. The retorts, each holding about fifty cases, are filled about one-half full of water so that the cans will not be damaged as they drop from the conveyer. When the proper number of cans have gone into a retort, the water is drained off and steam is turned on. The retorts are kept at a temperature of 230 degrees for periods ranging from thirty minutes, when the smaller cans are being handled, up to one and one-quarter hours for the largest sized cans. A self-recording chart is connected with each retort, and as each lot of cans goes through the old chart is removed and a new one put in place. At the close of each day's work, the charts are collected and filed in the office of the cannery superintendent. By this method, uniform sterilization for the entire output is insured.

As they come from the retorts, the can are carried by automatic conveyer through a washing machine where any oil that may have collected on the outside is washed off. In the washing machine, a hot solution first plays on the cans by two streams, one from above and the other from below. The second stage of this washing process is a repetition of the first, save that in this case the rinsing is done by clean hot water only.

The automatic conveyer is again waiting for the cans as they come from the washing machine, and carries them to the cooling tables in the shipping room on the lower floor. From these tables, they are either directly packed in cases for shipment or sent to another room to be cartonned or labelled, as the case may be, and then packed in cases—100 cans to the case—with an equal number of opening keys inside each case of unlabelled cans, or enclosed within the individual wrappers of the cans upon which labels have been placed.

## CLAM CANNING

Clam canning is carried on in Canada both on the Atlantic coast and Pacific coast. Forty-three thousand cases were canned in 1928. Over twenty thousand of this total were packed in New Brunswick, four thousand in Nova Scotia and fifteen thousand in British Columbia.

Canning practice in general use is first to steam the fresh clams lightly or pass them through hot water so that the shells may be opened up and the meat easily extracted. To prevent it from becoming tough, the extracted meat should at once be dipped in cold water. When the meat has been extracted from the shell the black snout is cut off and the thin skin or film covering removed and the clams are thoroughly cleansed of grit.

The meat is then placed in cans which are filled almost to the top with the clam liquor, which may be diluted with clean water, either fresh water or sea water. The covers are put on and the cans are then exhausted for ten minutes at 212° F., after which the tops are sealed. The cans are then placed in retorts and are cooked at a temperature of 240° F. A one pound can is cooked or processed for approximately twenty minutes and cans of other size for a proportionate length of time.

In British Columbia when the clams are brought to the cannery they are placed in large open floating crates whence they are taken as required, in accordance with the facilities available, and are cooked in vats. During the cooking process the shells open, and also from this cooking is obtained the

juice, or, as it is sometimes called, "clam nectar." From the cooking vats the clams are carried to tables where the pickers take the clams from the shells, discarding the shells and removing the black tip from the clam. At this time any discoloured clams are also discarded. The clams are next taken to the filling tables where the cans are filled and a supply of "nectar" is added. The covers are then put on the cans by machinery, and from there on the process is similar to that employed in fish canning generally. All clams, with the exception of the razor clam, are often put in the can whole but in the case of British Columbia razor clams the market demands that they be minced. Consequently before razor clams are put in the can, they are passed through a mincing machine.

### OTHER CANNED SEA FOODS

In addition to canned salmon, canned lobsters, canned sardines, and canned clams, various other canned sea foods are also put up in Canada. In these latter instances, however, the production is relatively small in each case, though the goods are of excellent quality, nourishing and tasty.

Canned pilchards head this list, so far as quantity of annual production is concerned, with an annual pack which has been increasing very rapidly and in 1929 was almost 100,000 cases. Pilchard canning in Canada is confined to British Columbia since it is only in the waters off that province that pilchards are taken by Canadian fishermen. Cod, haddock, herring, mackerel, crabs, and scallops are canned at some points in the Maritime Provinces. Abalone are canned in British Columbia. The processes employed in canning these fish and shellfish are all similar in general principle to those which have been outlined, though there are, of course, variations in detail.

OTTAWA, March 31, 1930.